NAVAL MEDICAL RESEARCH AND DEVELOPMENT COMMAND

Informational Briefing

National Naval Medical Center
Bethesda, MD 20889-5044

1991

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Informational Briefing

CAPT James N. Woody
Commanding Officer
NAVMEDRSCHDEVCOM
National Naval Medical Center
Bethesda, MD 20889-5044

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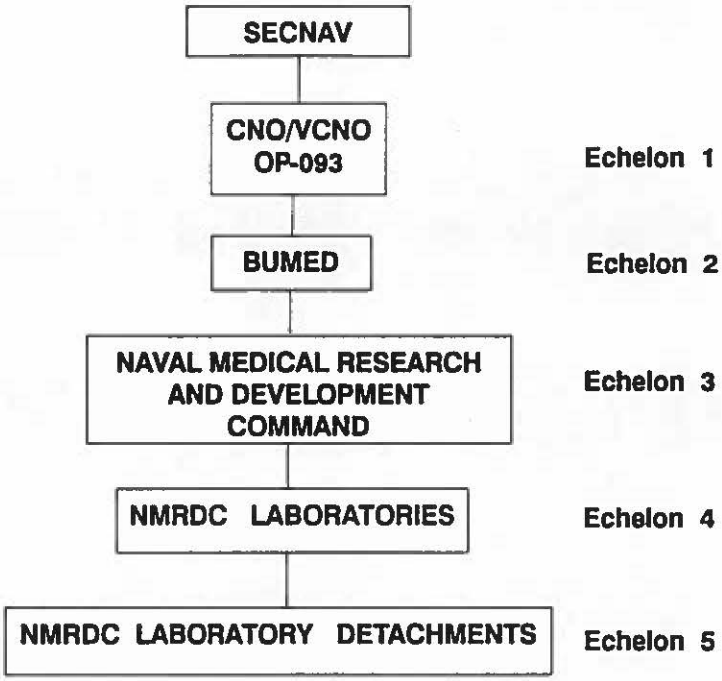
DEPARTMENT OF THE NAVY



MISSION AND FUNCTION STATEMENT

Mission

To plan, manage and direct research, development, test and evaluation (RDT&E) programs concerning the health, safety, and readiness of Navy and Marine Corps personnel in the effective performance of peacetime and contingency missions, and to perform such other functions or tasks as may be directed.

Function

Command BUMED RDT&E laboratories and activities by providing and exercising accountability for manpower, funds, facilities, and equipment resources.

Advise the Chief, BUMED, on RDT&E matters.

Provide guidance in the planning of Navy and Marine Corps weapons systems, life support systems, and personnel protection.

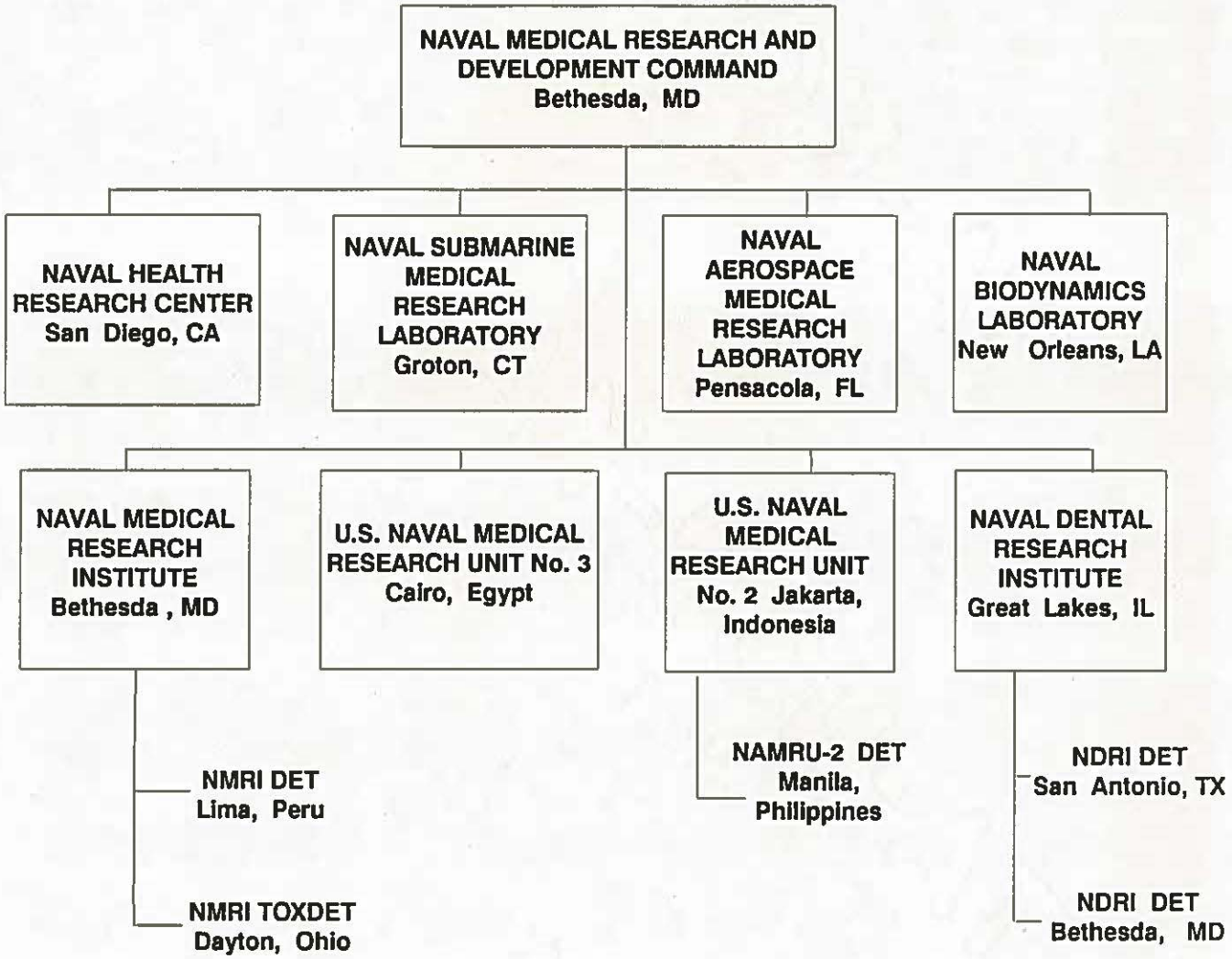
Coordinate research efforts of subordinate activities with other Navy commands and offices, other government agencies, civilian organizations, and foreign governments.

Implement and oversee policies concerning the protection of human subjects and the use of animals.

Direct and coordinate efforts to ensure a smooth transition of research assets and activities required to support Medical Department mobilization.

Provide to undertake such other functions as may be authorized or directed.

ORGANIZATIONAL STRUCTURE

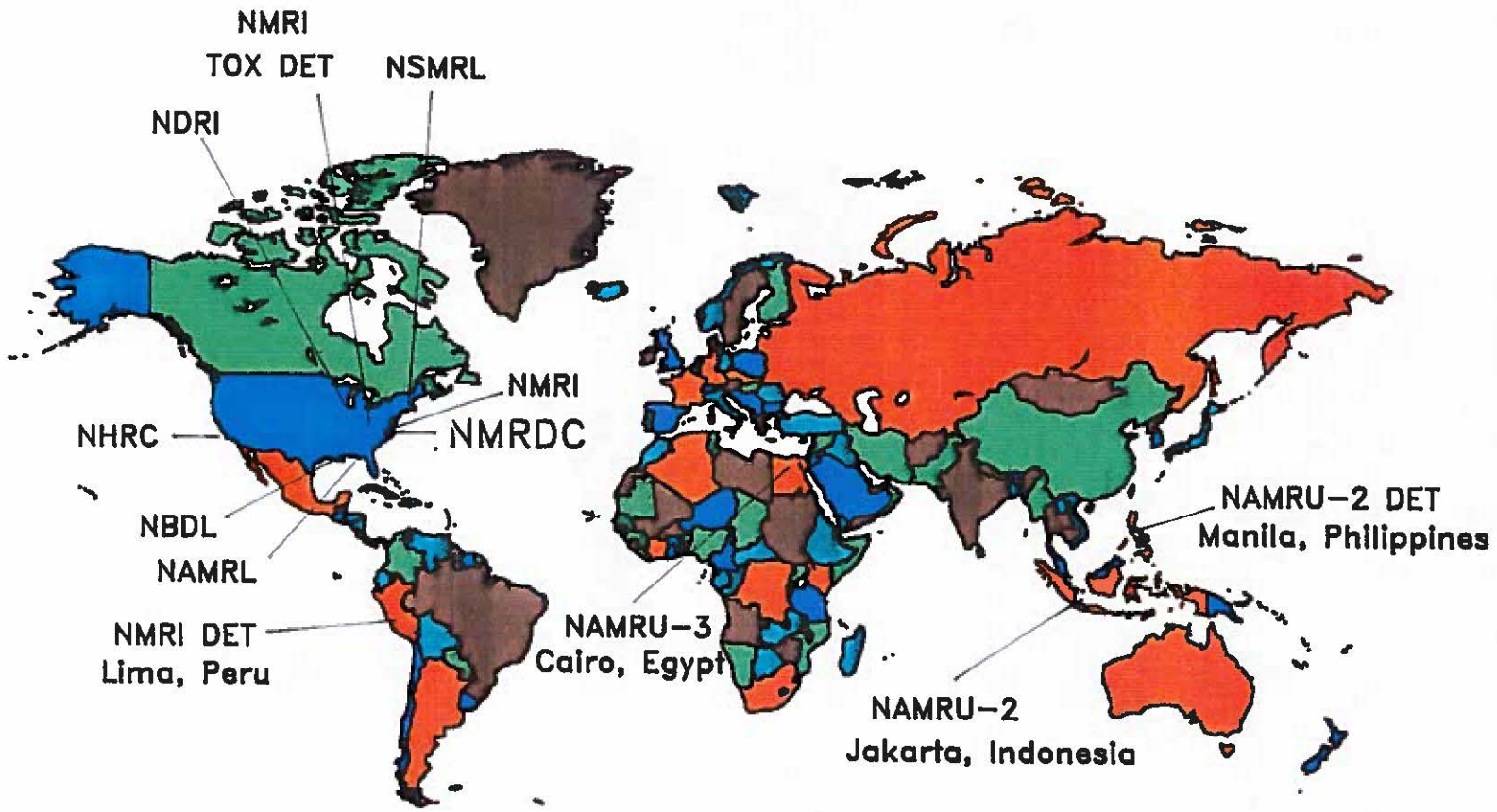


NMRDC FACILITY LOCATIONS AND AUTHORIZED PERSONNEL RESOURCES

LAB	TITLE	PERSONNEL			
HEADQUARTERS		**OFFICER**	**ENLISTED**	**CIVILIAN**	**TOTAL**
NMRDC	Naval Medical Research and Development Command, Bethesda, MD	14	3	21	38
LABORATORIES					
NMRI	Naval Medical Research Institute, Bethesda, MD	63	179	175	417
TOXDET	NMRI Toxicology Detachment, Wright-Patterson AFB Dayton, OH	5	9	5	19
NMRI DET	U.S. NMRI Detachment, Lima, Peru	7	3	1 46 FN *	57
NSMRL	Naval Submarine Medical Research Laboratory, Groton, CT	14	17	44	75
NDRI	Naval Dental Research Institute, Great Lakes, IL	8	14	13	35
NDRI DET	Naval Dental Research Detachment Naval Dental School, Bethesda, MD	3	4	0	7
NDRI DET	Naval Dental Research Detachment USAFSAM/NGD, Brooks, AFB, TX	1	1	0	2
NAMRL	Naval Aerospace Medical Research Laboratory, Pensacola, FL	20	20	54	94
NBDL	Naval Biodynamics Laboratory, New Orleans, LA	5	32	46	83
NHRC	Naval Health Research Center, San Diego, CA	13	12	77	102
NAMRU-2 DET	U.S. Naval Medical Research Unit No. 2, Manilla, Philippines	8	10	1 40 FN *	59
NAMRU-2	U.S. Naval Medical Research Unit No. 2 Detachment, Jakarta, Indonesia	7	2	0 55 FN *	64
NAMRU-3	U.S. Naval Medical Research Unit No. 3, Cairo, Egypt	15	20	11 193 FN *	239
TOTAL		**183**	**326**	**782**	**1291**

* Foreign nationals

NAVAL MEDICAL RESEARCH AND DEVELOPMENT COMMAND
WORLDWIDE LABORATORIES AND FACILITIES



LABORATORY STUDIES

Naval Medical Research Institute

- Physiologic effects and modeling of diving-related injury due to high pressure and ischemia
- Physiology of cold adaptation and non-freezing cold injury
- Biochemistry, immunology, and pathophysiology of sepsis and wound repair
- Immunology, molecular biology, and vaccine development for infectious diseases
- Mechanisms of immune cell recognition and regulation
- Toxicology of Navy operational chemicals

Naval Submarine Medical Research Laboratory

- Submarine and diving physiology and models for human decompression
- Hearing conservation for diving operations
- Effects of stress on team performance
- Improving performance on auditory and visual combat system displays

Naval Dental Research Institute

- Analyses of oral bacteria associated with periodontal disease
- Human immune response factors and rapid diagnostic assays for periodontitis
- Navy dental epidemiology and infection control

Naval Aerospace Medical Research Laboratory

- Effects and dosimetry of non-ionizing and laser radiation
- Aviation psychology, physiology and performance enhancement
- Improved methods for auditory testing, speech communications, and hearing conservation
- Visual-vestibular interactions influencing disorientation, instrument visibility and target acquisition

Naval Biodynamics Laboratory

- Biomechanical models for motion and injury prediction
- Evoked response assessment of central nervous system injury
- Human factor analyses of motion effects and motion sickness desensitization procedures

Naval Health Research Center

- Performance enhancement during sustained performance or under extreme environmental conditions
- Disease surveillance and risk factors in Naval personnel
- Automated systems for medical diagnosis and management and for assessments of mission-related cognitive performance
- Neuroelectric and neuromagnetic assessment of cognitive performance

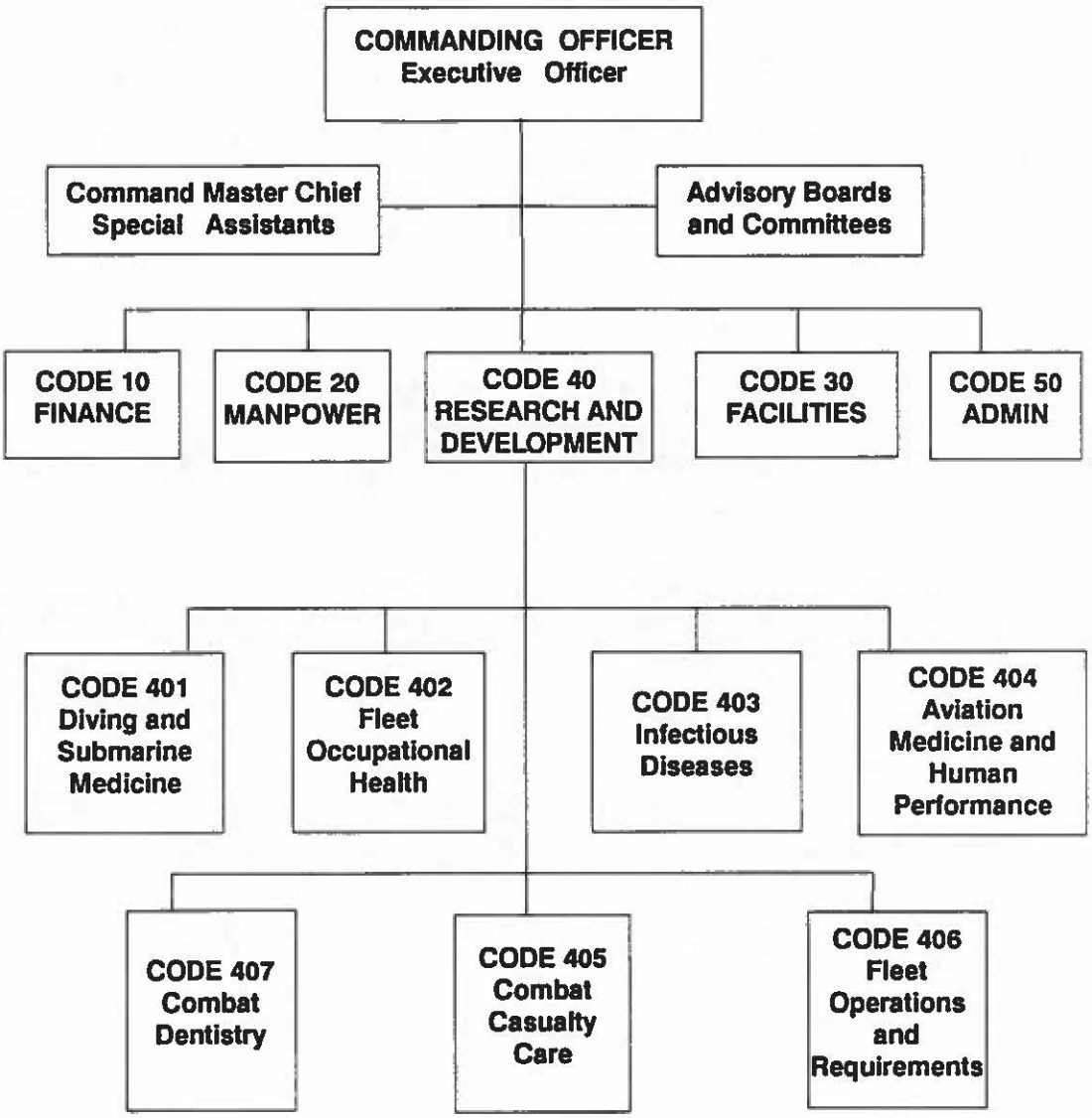
U. S. Naval Medical Research Unit No. 2

- Threat analyses of naturally occurring infectious diseases (malaria, arboviral diseases, hemorrhagic fevers, and leptospirosis)
- Analyses of the transmission, pathophysiology, prevention, and treatment of indigenous infectious diseases
- Development of improved methods for rapid identification of infectious disease agents
- Epidemiology and control of diarrheal diseases and the Human Immunodeficiency Virus

U. S. Naval Medical Research Unit No. 3

- Threat analyses of naturally occurring infectious diseases (malaria, arboviral and rickettsial diseases, schistosomiasis, and leishmaniasis)
- Analyses of the transmission, pathophysiology, prevention methods, and treatment of indigenous infectious diseases
- Analyses of antibiotic-resistant oral bacteria and rapidly progressive periodontal disease
- Development of improved methods for rapid identification of infectious disease agents
- Epidemiology and control of diarrheal diseases and the Human Immunodeficiency Virus

COMMAND ORGANIZATION



MAJOR RESEARCH PROGRAM AREAS

- Combat Casualty Care
- Infectious Diseases and AIDS
- Diving and Submarine Medicine
- Aviation Medicine and Human Performance
- Environmental and Occupational Medicine
- Fleet Operations and Requirements
- Combat Dentistry

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PROGRAM DETERMINANTS

- Mission analysis and risk assessment
- Formal "Medical Requirements" from OP-093 and BUMED
- Congressional/DoD direction
- Long-range medical research and development planning
- Availability of resources
- ASBREM/tri-Service responsibilities and commitments

FUNDING AGENCIES

Major Funding Sponsors

OP-02	Submarine Warfare
OP-03	Surface Warfare
OP-05	Air Warfare
OP-093	Naval Medicine (Surgeon General)
OP-091	Research, Development ,Test and Evaluation
ONR	Office of Naval Research
ONT	Office of Naval Technology
NAVSEA	Naval Sea Systems Command
SPAWAR	Space and Naval Warfare Systems Command
AMRDC	U.S. Army Medical Research and Development Command

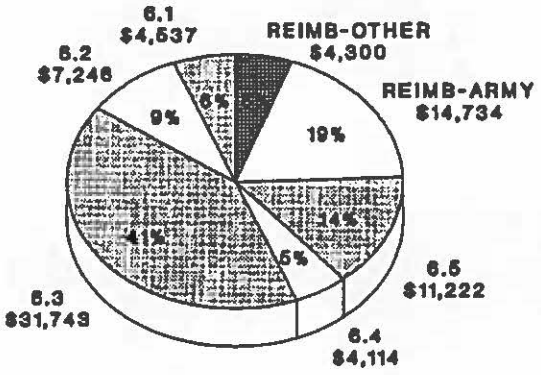
Minor Funding And Reimbursables

Army Aeromedical Research Laboratory
Coast Guard Research & Development Center
David Taylor Naval Ship Research & Development Center
Department of Transportation
Naval Underwater Systems Center (NUSC)
National Science Foundation (NSF)
Public Health Service (PHS)
State Department

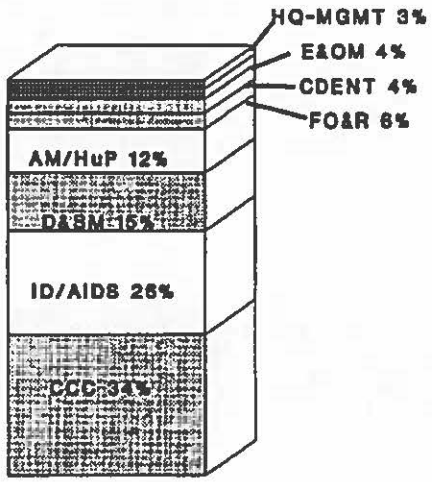
LANTNAVFACENGCOM	NAVAIRDEVCEN
NAVCOASTSYSCEN	NAVFACENGCOM
BUMED	NAVMILPERSCOM
NAVPERSRANDCEN	NAVSEASYSCOM
NAVSPECWARCEN	NAVSWC
NOAA	ONR
SPAWARSYSCOM	USAID

Some sponsors provide both major core funds and reimbursable funds for special projects to NMRDC

NMRDC FY 90 FUNDING ($K) BY CATEGORY AND PROGRAM



FUNDING CATEGORY
Total $77,896



FUNDING FOR
MAJOR PROGRAMS

HQ-MGMT	NMRDC Headquarters
E&OM	Environmental and Occupational Medicine
CDENT	Combat Dentistry
FOR&R	Fleet Operations and Requirements
AM/HuP	Aviation Medicine and Human Performance
D&SM	Diving and Submarine Medicine
ID/AIDS	Infectious Diseases and AIDS
CCC	Combat Casualty Care

RESEARCH PROGRAM AREAS

COMBAT CASUALTY CARE PROGRAM

Wound, Sepsis, and Shock

Hemostasis
- Pourable wound dressing
- Sutureless vascular anastomosis
- Chitosan-based coagulation

Wound Decontamination
- Biochemical lavage
- Laser-Based

Enhanced Healing
- Factor/gene transfection
- Augmented angiogenesis

Complications
- Sepsis/ARDS/shock
- Multiple organ system failure

Blood/ Blood Substitutes

Blood Availability
- Frozen/lyophilized
- Enzymatic conversion

Blood Storage/Utilization
- Twenty year depot
- Extended liquid shelf-life

Blood Substitutes
- Liposome-encapsulated hemoglobin
- Stroma-free hemoglobin

Stem Cells/Immune Function

Precursor Isolation
- Magnetic beads
- Factor-enhanced recovery
- Lymphokines/growth factors

T- Lymphocyte function/activation

Thermal Stress Medicine

Cold adaptation
- Hormonal alteration

Hypothermia
- Rewarming/ cardiac drugs

Non-freezing cold injury
- Mechanisms/ treatment
- Cold-induced amnesia

Heat Adaptation
- Performance assessment degradation

Medical Materiel/ Readiness

REFLUPS (Resuscitation Fluids Production System)
- IV fluid production

Blood thawing/washing
- Speed and sterility

Transcutaneous Biosensors
- Clinical diagnosis

Computer-Assisted Diagnosis
- Diagnostic modules

Casualty rate estimates
- Injury assessments

Disease/non-battle injury
- Medical planning needs

Noninvasive cutaneous monitors
- Hemotacrit
- Oxygen saturation of hemoglobin

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INFECTIOUS DISEASES PROGRAM

Diarrheal Diseases

Prevention
- ° Risk assessment
  - Etiologic agent surveys
  - Shipboard studies

Prophylaxis
- ° Vaccine development
- ° Vaccine trials
- ° Drug prophylaxis studies

Management
- ° Diagnostic assay development
- ° Antibiotic treatment trials

Malaria

Prevention
- ° Risk assessment
  - Epidemiologic surveys
  - Anti-malarial sensitivities

Prophylaxis
- ° Malaria vaccine development
- ° Drug trials

Management
- ° New diagnostic tests
- ° Drug treatment trials

Arboviral Diseases

Prevention
- ° Risk assessment
  - Epidemiologic serosurveys
- ° Insect repellent studies

Prophylaxis
- ° Vaccine development

Management
- ° Rapid diagnostic tests
- ° Anti-viral drug trials

Human Immunodeficiency Virus

Prevention
- ° Risk assessment
  - Seaport seroprevalence
  - High risk group analysis
  - Risk behavior determination
  - OCONUS natural history

Prophylaxis
- ° Education only

Management
- ° New diagnostic test analysis
- ° Possible future drug trials
- ° Task performance in early disease

In addition to the above, most major tropical diseases are under study at our OCONUS facilities. These include typhoid meningitis, rickettsiosis, leishmaniasis, filariasis, schistosomiasis (including field-testing of a topical anti-penetrant cream for preventive efficacy) and many others. A sizeable effort is underway to examine the pathophysiology of these diseases as they relate to mission-relevant illnesses.

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DIVING AND SUBMARINE MEDICINE PROGRAM

Diving Decompression Procedures

Develop new decompression schedules for air and mixed gas saturation and bounce diving. Using new statistical techniques, schedules will be based on physiologically tested data including measurements of inert gas kinetics in animal and humans. The schedules will be safer, more versatile, capable of real-time adjustment, and have a clearly assigned risk of injury.

Investigate methods for safely decompressing crew members from a pressurized compartment of a distressed submarine.

Develop improved decompression procedures for nonstandard hyperbaric exposures, i.e. long shallow, and exceptional exposure dives, such as submarine hull pressurization testing.

Biomedical Criteria for Diver Equipment

Develop and test physiologically based design criteria for improved performance of underwater breathing apparatus.

Develop models that predict human thermal physiological responses to all operational hyperbaric environments.

Specify biomedical criteria for improved thermal protection garments, and thermal guidelines for mission planning.

Develop protocols that maximize the safe performance of useful work at deeper depths for longer periods of time.

Diver Health and Safety

Evaluate the effectiveness of current treatments, and develop improved treatments for decompression sickness and for arterial gas embolism.

Define optimal 0_2 exposure safety limits for operational diving, and for the treatment of decompression sickness and arterial gas embolism.

Establish comprehensive hearing conservation standards for bareheaded, hooded, and helmeted divers. Standards will apply to air and mixed gas environments at all routine operational depths.

Evaluate the long term health effects of diving.

Evaluate multiple risk factors that may increase susceptibility to clinical decompression sickness.

Submarine Medicine

Establish a cell culture model that allows for direct assessment of the effects of physical, chemical, or radiation exposure on neural functioning.

Research psychophysical procedures for simple and complex auditory detection tasks that are valid, reliable, efficient, and easy to learn.

Evaluate the merits of various relative bearing indicators on CRT screens displaying a periscope line of view.

Develop methods to enhance the auditory and visual displays used by sonar operators to detect, identify, and track targets.

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AVIATION MEDICINE AND HUMAN PERFORMANCE

Sustained Operations (SUSOPS)

Assess and specify the effects of environmental stressors, workload, fatigue, and sleep deprivation on physical and mental performance during continuous and/or sustained Navy and Marine Corps operations.

Develop methods and recommendations to enhance operator performance under continuous and/or sustained operations.

- Define relationships between combat-related environmental stressors and operational performance.
- Test candidate pharmacologic and non-pharmacologic agents as countermeasures to performance decrement.
- Develop biomedical methods and establish countermeasure guidelines to enhance performance during continuous/sustained operations for aircrew, personnel aboard

surface ships and submarines, and those performing special warfare tasks.

Medical Assessments

Develop biomedical assessment and screening methods for Navy and Marine Corps aviation.

- Improve the naval aviation selection test battery.
- Develop performance-based standards (cognitive, sensory, and physiologic functions) for Naval aviation.
- Improve submarine psychiatric screening procedures.
- Improve indicators that predict success for classification and training in Navy special forces personnel.

Investigate psychological and biological factors that predispose personnel to illness episodes when exposed to stressors in training or operational environments.

- Evaluate risk factors for the development of infectious disease in recruits.
- Relate predisposing psychologic factors to biologic events that impair individual resistance to disease processes.

Readiness

Develop biomedical intervention techniques and recommendations for improved man and machine interface and increased safety and survivability.

- Evaluate technologies (physical fitness, pulsating gravity suit, positive pressure breathing, body position) to enhance gravity tolerance and avoid gravity induced loss of consciousness.
- Develop in-flight physiologic monitoring systems.
- Analyze methods to protect Naval personnel from the adverse effects of ship motion.

- Develop a model for visual detection of air-to-air missiles.
- Evaluate the impact of laser dazzle and low level laserlight on cognitive and visual search performance.
- Develop methods to protect aviators and other personnel from the effects of agile lasers.
- Analyze the physiologic stresses of acceleration and impact.
- Develop an instrumented manikin based on quantitative data derived from head and neck responses to acceleration and impact stresses.

Evaluate the Navy's Health and Physical Readiness Program.

- Evaluate medically-related standards and identify intervention techniques that will increase personnel effectiveness.

Chemical Defense

Develop and validate tri-Service standard tests and test batteries for assessing performance effected by chemical defense antidotes and pretreatment drugs.

- Standardize cognitive and physical performance test batteries.
- Validate test batteries under field conditions.
- Design computer-generated models that characterize the critical component of selected military tasks.

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ENVIRONMENTAL AND OCCUPATIONAL MEDICINE

Assessment of Biomedical Risk

Identification of biologic hazards in the workplace and the operational environment.

Elucidation of the mechanisms of toxicity for chemicals in common use in the Fleet.

Development of exposure criteria for:

- chemicals, solvents, lubricants, propellants, launch/blast gas, weapons components, etc.

Determine dosage effects for exposure to such materials.

Prepare risk assessments for Navy-developed materials.

Radio Frequency Dosimetry

Evaluate the bubble technology, proven for neutrons, to produce an improved means of dose determination for nonionizing (RF and microwave) radiation.

Electromagnetic Radiation

Evaluate the effects of high pulse energy on cellular mechanisms.

Evaluate the effects of high pulse energy on behavior.

Provide data for determining the safe operating conditions and levels of exposure for Navy personnel working with directed energy systems (i.e. radar).

Application of Physiologically-based Pharmacokinetics (PBPK) to Navy Toxicology Studies

Develop mathematical models to predict accurately effects of potential toxic chemical exposure in the operational environment.

Chemical Warfare Defense

Analyze the cumulative performance and physiological effects of low dose CW nerve agent (soman) exposure.

Evaluate pretreatment (pyridostigmine) effects on performance and sustainability in a low dose nerve agent environment.

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FLEET OPERATIONS AND REQUIREMENTS

Navy Science Assistance Program (NSAP)

Coordinate efforts with the Fleet and Marine Force through NSAP to address acute operational problems needing medical consultation or R&D.

Deployable Medical Systems (DEPMEDS)

Coordinate projects under medical research and development with the needs of the DEPMEDS System.

Casualty Information Systems

Initiate projects to determine casualty rates accurately under various scenarios and coordinate information with Navy and Marine Corps medical planners.

Medical Research Requirements

Foster the development of medical research requirements that address current and future Fleet and Marine Corps needs.

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COMBAT DENTISTRY

Combat Dental Care

Study the incidence and prevalence of complications related to the removal of third molars (wisdom teeth).

Determine the oral effects of smokeless tobacco use by Navy personnel.

Determine the cost effectiveness of applying sealants to the occlusal (chewing) surface of teeth that have incipient dental decay.

Studies of rapidly progressive periodontal diseases in Egyptian civilian and military personnel are being conducted because early indications are that the etiology is different from that found in other countries.

Readiness

Improved military readiness by identifying military personnel that are at high risk of a dental emergency (especially as the result of periodontal disease) through the development and use of rapid diagnostic assays using monoclonal antibodies and DNA probes or by rapid microbial enzymatic indicators.

Determine the incidence and prevalence of antibiotic resistant oral bacteria in military and indigenous personnel living in the Middle East.

Study the epidemiology of orofacial diseases among active duty and reserve naval forces and identify determinants of disease.

Develop effective modalities for the treatment of polymicrobic wound infections.

POC: CAPT R. Walter, DC, USN 203-449-3263 AV 241-3263 FAX AV 729-4279

SELECTED CURRENT ACHIEVEMENTS

COMBAT CASUALTY CARE

- Demonstrated that red cell aging can be arrested by using special nutrients: pyruvate, inosine, phosphate, adenine (PIPA). Rejuvenated cells "live" fourteen days longer than non-rejuvenated red cells. (Navy Blood Research Laboratory, Boston, MA 6.3)
- Identified an unusual protein extracted from the plasma of the horseshoe crab that binds endotoxin and prevents gram negative septic death in experimental animals. (Associates of Cape Cod and NMRI, 6.3)
- Produced a universal "O" type red blood cell from "B" type blood cells. (The New York Blood Center, New York, NY 6.3)
- Developed a technique that uses antibiotic beads as part of major orthopedic surgical procedures with results that show enhanced wound healing and reduced infection. (University of Louisville School of Medicine, Louisville, KY, 6.3)

INFECTIOUS DISEASES AND AIDS

- Identified the bacteria causing acute diarrhea in U.S. troops during the UNITAS/WATC cruise and during Operation Brightstar. (NAMRU-2, NAMRU-3, NMRI, NMRI DET 6.2)
- Identified and tested new antibiotics effective in preventing acute bacterial diarrhea in the Mideast, S. America, and West Africa. (NAMRU-3, NMRI, NMRI DET 6.3)
- Developed a series of rapid diagnostic tests for bacterial, viral, and parasitic diseases for use during operational deployments. (NMRI, NMRI DET, NAMRU-2, NAMRU-2 DET, NAMRU-3 6.1)

- Evaluated new diagnostic tests for malaria, assessed the effectiveness of various malarial prophylaxis regimens, and studied the natural occurrence of and the development of immunity to malaria in Indonesia, Africa, Peru, and the Philippines. (NMRI, NMRI DET, NAMRU-2, NAMRU-2 DET 6.1 & 6.2)
- Established baseline threat assessment data for HIV prevalence in major seaports utilized by U.S. forces in Asia, Peru, the Mideast and Eastern Africa. (NAMRU-2, NAMRU-3, NMRI DET 6.3)
- Established and deployed a Navy Forward Laboratory in Saudi Arabia in connection with Operation Desert Shield. This DoD laboratory will diagnose and test for endemic disease and special disease agent threats.
- Developed a vaccine candidate, now ready for initial testing in humans, for prevention of diarrhea caused by the bacterium Campylobacter. (NMRI 6.3)
- Demonstrated the existence of a strain of Ebola virus as well as Simian Hemorrhagic Fever virus in the Philippines. (NAMRU-2 6.2)
- Demonstrated a significant boost in antibody titer to a P. falciparum sporozoite peptide when combined with a commercial adjuvant (ribi-DETOX) in clinical investigation vaccine studies. (NMRI 6.3)
- The transfer of the schistosomiasis drug screening program from Walter Reed Army Institute of Research to the U.S. Naval Medical Research Unit No. 3, Cairo, Egypt, resulted in consolidation of the DoD schistosomiasis research program in Egypt. (NAMRU-3 6.2)
- Initiated studies of respiratory diseases to address the ongoing problems of Fleet and Marine personnel in training camps, aboard ship and during deployment. (NMRI, various OCONUS labs, 6.2)

- Determined a high failure rate with the currently recommended treatment regimen for leishmaniasis. In field trials at the Naval Medical Research Institute Detachment, Lima, Peru, researchers are testing improved treatment regimens. (NMRI DET 6.3)

DIVING AND SUBMARINE MEDICINE

- Recommended to NAVSEA that ascent from saturation dives deeper than 200 fsw should continue to be at 4 fsw/hr; rates should be slowed to about 2.4 fsw/hr when divers are shallower. (NMRI 6.3)
- Developed a real-time, probabilistic N_2-O_2 model for human decompression that considers onset time of DCS symptoms (will form basis of new decompression tables to be delivered in 1991). (NMRI 6.3)
- Demonstrated that dietary carbohydrate loading improves work capacity and helps to maintain core temperature during intermittent work in cool water. (NMRI 6.3)
- Determined that during 150 fsw saturation dives hyperoxic HeO_2 prevents exercise-induced loss of maximal leg muscle power that is observed with normoxic HeO_2. Drinking a glucose solution during exercise does not alter O_2 uptake or net thermal balance. (NMRI 6.3)
- Determined during 1000 fsw saturation dives that hyperoxic HeO_2 reduces the rate of muscle fatigue observed using normoxic mixtures, caffeine increases body heat loss during exercise, and light exercise ameliorates post-dive physical deconditioning. (NMRI 6.3)
- Completed and submitted to NAVSEA revised air purity guidelines for dry deck operations. Recommended trial of new hydrocarbon detector onboard submarines. (NMRI 6.3)

- Noted agreement between maximum likelihood prediction and findings of diver tolerance to respiratory loading during 150 fsw air dives. (NMRI 6.3)
- Recommended diver-adjustable hydrostatic loading of underwater breathing apparatus (UBAs) to accommodate individual variations in respiratory mechanics. (NMRI 6.3)
- Demonstrated the feasibility of using electrical resistance heating of hands and feet to improve performance and comfort during 3 ^{o} C immersion. (NMRI 6.3)
- Determined that cutaneous Helium efflux at depth is insufficient to dilute alternate dry suit insulating gases. CO_2 is an unsatisfactory insulation gas due to skin irritation. (NMRI 6.3)

FLEET OPERATIONS AND REQUIREMENTS

- Developed programs to reduce attrition during Naval Special Warfare training. (NHRC-6.2)
- Demonstrated functional thyroid hormone abnormalities in men exposed to cold for prolonged periods. (NMRI 6.2)
- Demonstrated efficacy of ice vest to maintain performance in high heat environment.. (NHRC 6.2)
- Predicted disease non-battle injury in Desert Shield using data from Vietnam War. (NHRC 6.3)

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

- Developed and validated superheated liquid drop "bubble" detectors for use as a direct reading field dosimeter to measure neutron radiation. (NSWC 6.3)

- Completed an evaluation of cyclotriphosphazene hydraulic fluid used in the Fleet and found it to be non-toxic. (NMRI TOXDET 6.3)
- Completed an evaluation of Halocarbon 27S lubricating oil used in the Fleet and found it does not pose an unusual risk for sailors. (NMRI TOXDET 6.3)
- Completed an evaluation of OTTO Fuel II regarding potential for teratogenic effects and determined it is not a teratogen in rats or rabbits. (NMRI TOXDET-6.3)
- Completed first experiments using monkeys to determine the effect and time-related cognitive behavioral changes after exposure to high energy pulsed microwaves (radar). The findings showed a statistically significant alternation in behavior after exposure to high energy microwaves. (NAMRL 6.2)

COMBAT DENTISTRY

- Completed a "Dental Treatment Needs Survey" for both active duty and reserve Navy and Marine Corps personnel. (NDRI 6.3)
- The role of the spirochete Treponema denticola in periodontal disease is being elucidated utilizing the resources of a number of institutions, NDRI, NAMRU-2, Loyola University, and the University of Oregon School of Health Sciences. (NDRI 6.1)
- Completed two projects related to infection control in Navy and Marine Corps dental clinics. First, the costs associated with initiating rigorous infection control safeguards in all dental clinics was determined. Second, a clinical research study was conducted to assess the longevity and durability of autoclavable dental handpieces. (NDRI 6.3)

ADDENDUM

Naval Medical Research and Development Command

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Naval Biodynamics Laboratory (NBDL)

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